Preface

Thank you for choosing BEEM Outdoors, LLC. products. This manual provides you with some important information about the operation and maintenance of this machine. If you have any question about our products, please contact your maintenance direct number on the generator or call **1-855-255-2632**.

Before using this generator, you are strongly advised to read the following manual and fully understand its contents.

We use a dedicated gas (NOT gasoline or diesel) engine for this generator set to ensure the performance of our generator sets and to be more suitable for maximum power output and performance. Through constant research and development, our generator units have more advantages than other similar products. Just a few of our advantages over others is our liquid-cooled exhaust system, larger engines with more cylinders, silent cooling system, electronic speed control system, unattended power generating, multi-energy generation technique, intelligent control systems, ultra-low temperature start technology, etc.. Some of these features are optional and according to the different power requirements of the customers. We always strive to always provide you with the newest in high-end technology and quality products.

Because of the constantly updating of our products, if you find any indicated differences is this manual that may be slightly different from the unit you have, please contact us or your nearest dealer for any questions you may have.

"Complete Customer Satisfaction is our mission". If you ever have any suggestions or comments on how we may improve your experience using BEEM Outdoors, LLC, products, please contact us., we will appreciate hearing from you.

If you encounter problems or difficulties using our products, please contact us promptly. We will help and attend to your needs as quickly as possible.

Announcements

Because this generator can be used in a single fuel or multi-fuel use, please use and maintain according to your generator selected fuel type. **THIS IS VERY IMPORTANT AS THE SETTINGS FOR NATURAL GAS (NG) USAGE AND LIQUID PROPANE GAS (LPG) ARE DIFFERENT.**

Before starting generator：

● Read the user manual and follow the generator set operating instructions carefully.

● **Not operating according to these instructions can cause personal bodily injury or loss of life.**

Words such as warning, danger, and attention are is used to indicate the possibility of injury and/or damage when operating this generator set.

Note

NOT following these operational requirements and instructions may result in personal injury and damage to the engine or other equipment, appliances, or other property.

Caution

NOT following these instructions and operating requirements may result in personal injury or other equipment damage.

Warning

NOT following these instructions and operating requirements could result in serious injury or loss of life.

Users must operate in accordance with these guidelines; otherwise engine and other mechanical or electrical damage may occur. Individual injuries or casualties resulting from not following these instructions will relieve BEEM Outdoors, LLC, and all others involved in the sales, service and warranty of its' products of all liability to those involved.

This manual contains the international symbol ：

The warning labels are included in the instructions：

Warning：The engine used is exclusively for powering generators and has been modified from the original 465Q engine. Please follow the instructions contained in this manual for repair and maintenance. Any adjustments or modifications not included in this manual are NOT allowed and will void all warranties. In the event you may need maintenance or warranty information, please call **1-855-255-2632**. Performing work or service without a designated service or warranty representative may void all warranties. These provisions are mandatory. Please read the "service manual" for details.

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Chapter One: Technical Features of the 20KW Generator

Ⅰ. Technical Feature of the 20KW Multi-Fuel Generator

This 20KW generator is multi-fuel drive uses an optimized dedicated multi-fuel engine. According to our standards, we have designed this unit in a simple and environmentally safe, and user friendly means:

1. Speed Regulating System: The 20KW uses an internally designed electronic speed control system, allowing for quick and easy adjustments to the engine speed that can be stabilized to specific speed ranges. This control system allows the engine to run more smoothly and respond quickly to sudden increases or decreases in required engine speeds.

2. Silent Air In-take System: Extra large air intake cross-sections in the housing enclosure ensure ample air flow and engine in-take. This unique housing enclosure structure leads to a significant reduction operating noise.

3. Large Liquid Coolant Radiator Reservoir: The use of and oversized liquid coolant radiator reservoir, like those used for larger automobile engines, allow for the use of more engine coolant and a larger radiator coil surface to utilize more liquid coolant to

maintain a more ambient and stable engine temperature during even the hottest times of year and hottest climates. This function can add greatly to life and long term operating dependability of your BEEM Outdoors 20KW generator.

4. Automatic Transfer Switch Function: These units are Automatic Transfer Switch compatible which will automatically, without personal involvement, start the generator, and produce the required power needed up to 20KW.

5. Intelligent Hazard Control System: the use of BEEM Outdoors, LLC's Intelligent Hazard Control System function warns of hazardous engine or generator conditions. This system continually checks and monitors the units operating conditions and will automatically shut the unit down to help avoid hazardous and costly damage can happen. The system uses and visual control panel that can preset according to the user's needs.

6. Ultra-Low Temperature Start Function: Along with an extra large-capacity oil pan for more engine oil capacity, this systems design includes an automatic oil heating function to ensure that the unit can start smoothly in low temperature circumstances and minimize the impact on the environment.

Ⅱ. Main Performance Index

The technical index of this 20KW generator may vary according to user's selective range. and requirements. Please refer to the generator performance parameter table for details.

Ⅲ. Main Components

Please see the enlarged drawing

Chapter Two: Transportation of Generator

Ⅰ. Transportation of Generator

The generator must be properly secured to insure safe and smooth transport through the transportation channel. Ensure that the surface where the generator is placed can withstand the shipping weight of the 20KW generator unit of 889 pounds.

Do not stack any object of more than 300 pounds or 135 Kkilograms on the top surface of the generator.

Note

DO NOT tilt the generator more than 30 degrees as the unit may roll over. Avoid where possible transporting on the uneven ground. Avoid violent shaking or dropping the unit during transportation as severe damage may occur.

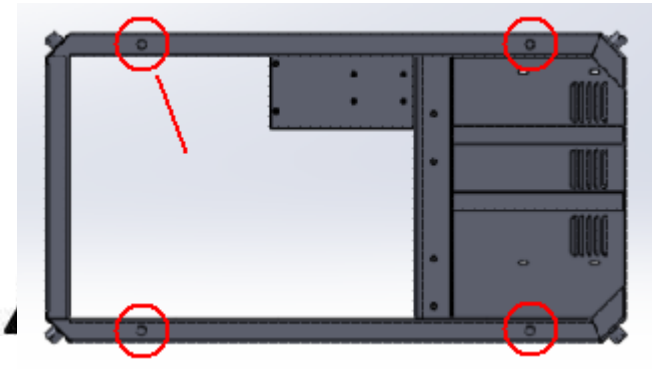
When using a forklift during transportation, ensure that the forks are wide enough and properly placed under the generator unit to lift in a level means. Fully insert the forks below the generator. When placing the generator unit down, do so in slow controlled manner without dropping, and place on a smooth level sturdy surface capable of supporting the weight of the generator.

Ⅱ. Loading and Unloading of Generator

Take extreme care to avoid shipping damage or sudden impact during transportation or installation of the unit. Once the generator arrives at the destination, please unload and remove in the following manner:

- Use a forklift or proper sized pallet jack to lift the generator unit with the packing fully intact and lower to the ground or supportive surface.
- Remove the generator packaging, carton box and bags, and remove the accessory box.
- To remove the 4 tripod mounting bolts, raise the generator unit then remove the bolts from the base of the generator connected to the shipping frame.
- Adjust the four lifting ropes on the lifting holes. The length of them should be as same as possible.

- Remove the shipping frame and attach the 4 foot supports.
- Put the unit on the permanent surface.
- Adjust the height of the 4 outriggers to make the generator unit level and steady where it cannot be rocked back and forth or to one side or the other.



NOTE: If the generators is to be used where placed for a long-time, remove or do not use the outriggers and place the metal generator frame directly on the hard flat surface.

Ⅲ. Installation of Generator

When ready to install the generator, make sure the installation requirements meets the following:

1. Installation Location

Caution

- Never install the generator in an enclosed room or an area where the engines exhaust are free to enter a living area in your home, your neighbors home or business.
- Exhaust gas can be deadly to humans, pets, and plants if inhaled or prolonged exposure.

Note

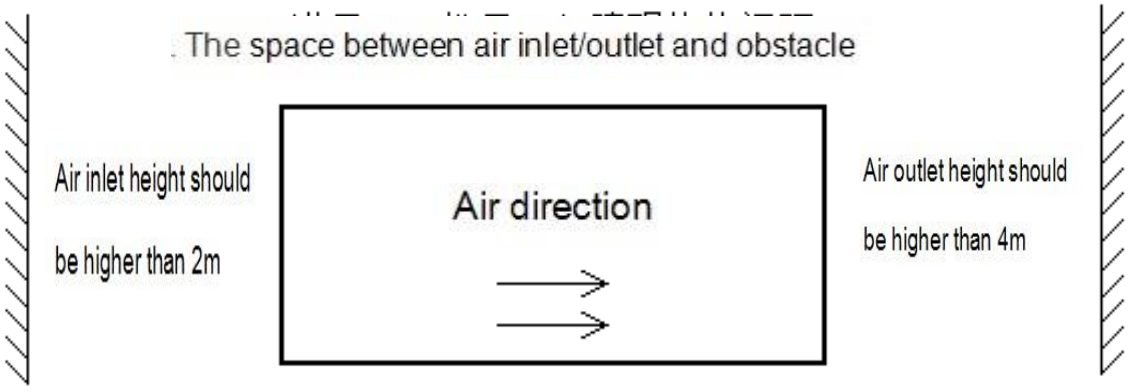
- If the unit is to be installed above ground level, make sure safe and sturdy access is available completely around the generator unit in the event service or possible component replacement is required after the installation. Not having clear safe access could prohibit future service requirements from taking place.

Note

- Even though the BEEM Outdoors LLC. 20KW Standby Home Generator is one of the quietest on today's market, consider noise issues of the running generator and how it may effect residential neighbors or adjoining businesses.
- Make sure that the exhaust gas is vented away from all living areas including any adjoining neighbors or businesses.
- Avoid installing the generator unit in a low lying area susceptible to rising or standing water as this can cause premature damage to the unit.
- Avoid placing the generator unit in areas susceptible to strong winds without securing unit to its foundation to prevent movement.
- The operating generator may interfere with the operation of nearby electrical appliances and equipment. Consider this issue in final placement.
- Do not place or install the generator unit in areas effected by heat or exhaust created by nearby equipment.
- In areas effected by high snow accumulation, place in areas, or in raised areas, that can be kept clear of high snow accumulations as this can create reduced air flow to the generator unit and cause damage to the unit.

2. Installation Space and Air Flow

- Always keep ample space between the generator and combustible and flammable materials.
- Install making sure that the gas line/line are not crimped or bound in any manner.
- The picture below shows the minimum space required between the air intake and exit from the generator for proper installation. Leaving less space could do harm to the generator unit and void all warranties.
- In order to prevent air flow obstructions after installation, when installing more than one generator in close proximity to another, allow the same distance between the generator units as indicated to be left between as single generator and any walls or air flow obstructions. Please contact a qualified generator service should you have any unique circumstances.


The space between air inlet/outlet and obstacle
Air inlet height should
be higher than 2m
Air direction
Air outlet height should
be higher than 4m

3. Installation manner

After determined the installation location and space, you can install the generator. Installation Methods.

Indoor installation:

● Check the local zoning and building code regulations concerning indoor installations of any generator unit to insure proper compliance and permitting where required.

- Place the generator unit on the hard flat and level surface.

● Air intake and exhaust space allowances should follow those pictured above.

● Check for any gas leakage.

Note

Ensure there is not any unobstructed ventilation issues including allowing any exhaust gas back into the air inlet areas.

Warning

Exhaust gas contains large amount of dangerous and odorless carbon monoxide gas. Extended exposure to carbon monoxide gas can result in carbon monoxide poisoning and death. Always check for leaks. Indoor air circulation is a must and can affect engine performance. High concentrations of leaking gas can cause explosions.

Outdoor installation：

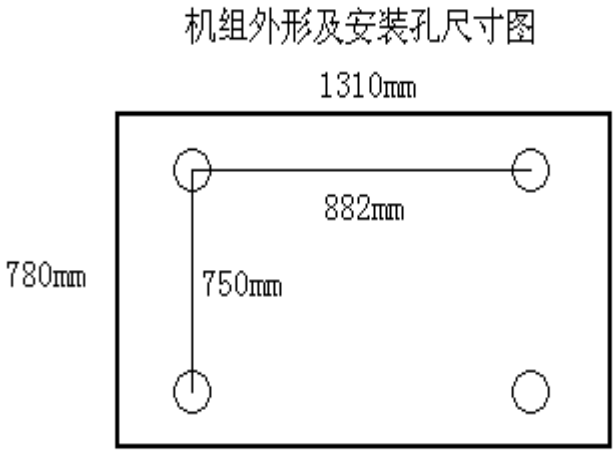
● Choose an appropriate installation site. Place the generator unit on concrete or other permanent hard surfaces. Outdoor weather and temperature environments can be severe and consideration should be taken to minimize extreme conditions.

● Outdoor gas lines should be protected against possible damage from weather, general maintenance of the generator unit or, surrounding areas that could cause leaks.

Note

Avoid extreme temperature exposure for prolonged periods of time. Long-term exposure to harsh weather conditions can cause premature aging of the generators housing enclosure and internal components. Take measures to protect the generator unit from extreme weather conditions. **DO NOT** have open flames or fires

Installation holes dimensional drawing



within 10 feet of generator.

Chapter Three: Generator Use

Ⅰ. Usage Precautions

1. **Exhaust is poisonous and can kill**: Do not use generator sets in enclosed structures or rooms without proper ventilation to remove exhaust fumes from the area. Inhaling of the generators exhaust gas may cause comas or death.

2. **Fuel gas is flammable and poisonous**: Turn on gas before starting the generator. Do not smoke within 10 feet of generator. If excessive amounts of the fuel gas are accidentally inhaled, immediately seek medical attention. Dropping or excessive tilting of the generator during transit or movement can cause gas and coolant lines to loosen and leak during operation so check all lines for leaks before starting.

3. **Engine and exhaust muffler heat**: Never place the generator where children, pets, or other pedestrians frequently accumulate and meet. When the generator is running, do not place any combustible or flammable materials within 6 feet of the exhaust outlet. Do not cover the generator with dust or weather protection cover while running.

4. **High-speed rotation when running:** While engine is running, do not place hands or other body parts inside the generator enclosure. Inside the generator enclosure are several moving parts such as the water pump belt and fan, generator head, etc... Do not throw or drop objects in the generator enclosure. These acts can cause bodily injury.

5. **Vibration during operation**: Operating generator units will produce subtle vibrations. These vibrations may be greater when starting or stopping the generator unit. Do not place any objects on the engine or other interior generator enclosure components.

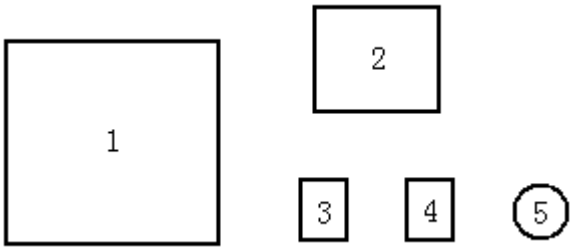
6. **Fuel gas is explosive:** Before connecting the gas line, make sure the gas lines do not leak. Gas is highly flammable and explosive; leakage of small to moderate concentrations can lead to a spontaneous combustion that could cause death or severe injury.

7. **The generator unit produces high electrical voltage**: The generator unit produces 240 volts or higher operating voltage when running. Electric shock is possible if the generator unit is not properly grounded or touched in a prohibited area while running. Keep hands and other body parts away from all electrical parts while running.

8. **The open generator unit produces high noise levels:** If the generator enclosure top or sides are removed or left open while the generator unit is running, excessive and unsafe noise levels may be experienced which can cause hearing loss. Always where hearing protection if within 25 feet while the generator unit is running with any of the enclosure sides or top open or removed. The generator units top and sides should be kept closed while running to avoid unsafe noise conditions.

Ⅱ. Operating System Functions and Definitions

Depending on the generator unit model, control button functions may vary significantly. Refer to the following functions:



1. control panel
2. circuit breaker
3. power switch
4. fuel switch
5. fuse

1. **Control panel**

Function, use: Please refer to the LCD panel User Manual for details.

2. Circuit breaker：

Function：The circuit breaker controls the ON/OFF functions of the generators electrical power output. When this switch is in the up (ON) position, the electrical power output will be produced normally. When this switch is placed in the down (OFF) position, electrical power output will be broken, or turned off. However, as a safety function, when this switch is placed in the ON position, the production of a too large of an electrical load or a short circuit due to faulty operation, the switch will immediately and automatically switch to the OFF position in order to protect the generator from damage. Should this occur, turn off the generator unit and correct the cause before restarting and placing the circuit breaker in the ON position again.

Use：When starting manually, always start the generator before placing the circuit breaker in the ON position. Likewise, when operating manually, place the circuit breaker in the OFF position before shutting the generator down.

3. Power switch：

Function：The power switch controls the entire generator set control system. If this switch is placed in the OFF (O pushed in down mode) position, the internal electrical control circuit of the unit will not have any electrical power. When this switch is placed in the ON (I in the up mode) position, the control system can be started, tested and run.

4. Fuel switch：

Function：The fuel switch allows the fuel to flow to the engine when placed in the ON (I is in the up mode) position. Likewise, the switch turns the flow of fuel off to the engine when placed in the OFF (O pushed down) position.

5. Fuse:

Function：The fuse has been pre-set to protect the generator set from short circuiting from inside or outside. When the fuse encounters any incorrect electrical operations, the fuse will burn out to protect the electrical circuits.

Use：To access or change, twist the fuse cover with the appropriate size Phillips head screwdriver counter-clockwise and remove the internal fuse. Check whether the fuse has is burned out. If burned out, replace the fuse and re-insert into the fuse opening and secure by twisting the fuse cover clockwise.

6. Emergency stop switch

Function：The photo above is of the **Emergency Stop Switch** and is located on the front face of the generator unit. When depressed, all generator control systems will immediately shut down, including the engine and generator head. This **Emergency Stop Switch** should be depressed should any unexpected emergencies occur. Depressing this button can help minimize dangerous occurrences to persons, pets, property, plants, or to the generator unit itself.

Use：When an emergency occurs, immediately press the **Emergency Stop Switch**. The unit will immediately stop running. Once the switch has been depressed and the emergency has passed, to re-start the generator unit, rotate clockwise 90 ° to pop up into the normal operational position.

Ⅲ. Preparations before 1st Use

Before the 1st use of the generator unit, check all generators systems for proper installation and visual working conditions, including the fuel lines and connections, engine condition, control panel, environmental conditions, and safety measures.

Warning

Before first use, you must run through the systems of the generator one by one to

confirm whether they meet the following requirements.

1. Oil Lubricant:

Natural Gas and Liquid Propane Gas fuel engine lubricant oil recommendations. Choosing the correct engine oil should be on the basis of the local air temperature conditions. Proceed according to the table below. The quality of engine oil can not only affect the engine reliability, but also the engine emissions. In order to ensure reliable engine performance and emission standards, you must use engine oil according to the following requirements.

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Environment Temperature	Engine Oil Number(optional)
0 F to – 22 F	5W/30 10W/30
0 F to 86 F	10W/30 15W/40
Above 86 F	15W/40

For NEW engines and generator sets, oil is NOT INCLUDED in the engine block or oil reservoir when the generator set is delivered. Refer to the above table for the recommended oil weight to be added to the engine before starting. Fill the engine to the required level before attempting to start the engine. NOT following these instructions will result in permanent damage to the engine and void all engine warranties. Periodically check the engine oil level to insure proper engine protection and add as needed

Do not allow dirt and foreign objects to enter into the oil or engine oil inlet.

2. Engine Coolant：

Only use engine coolant (anti-freeze). The coolant should be new and not previously used.. Not using the require amount of engine coolant could cause over heating of the engine and cause serious and irreversible engine damage. Periodically check the engine coolant level to insure proper engine protection and add as needed.

There is not any engine coolant in the radiator when generators new and delivered. Fill radiator and coolant system with recommended quantity of coolant after installment of generator and before starting for the 1st time. After starting the engine the 1st time, allow the engine to run for one minute, then shut down. Check the coolant level and add as needed to the proper level.

Caution

Engine coolant temperatures can reach as high as 158 degrees Fahrenheit，do not open radiator cap while engine is hot or has been running more than a few minute.

3. Liquid petroleum gas (LPG)

When using LPG as fuel, make sure the pressure of LPG is normal, or the generator unit will not start or could have an electrical which can cause damage to electrical appliances and equipment.

DO NOT remove or loosen gas lines while running. Check for gas leaks prior to starting the generator. Verify consistent line pressure for leaks by applying a soap and water mixture applied to the line connections and joints or by using an in-line pressure gauge. A leak may be indicated if the soap and water mixture forms bubbles around the joints or connections. If testing by using an in-line pressure gauge. Once the gas line is fully pressurized, check the pressure shown on the gauge, ten shut off the gas supply to the line. If the line pressure decreases than a leak may be present. For testing purposes, observe the joints, connections, or pressure gauge for at least one minute.

If a leak is detected or suspected, fix the leak prior to starting the generator.

Note

The correct LPG pressure range for this generator is 2.0kpa—3.5kpa (0.29–0.52psi)

4. Natural gas (NG)

The generator can use most residential or commercial NG as fuel. When using NG as fuel, use the correct gas pressure and gas line interior diameter before staring or using.

Note

The gas flow and pressure can affect the running efficiency of generator.

The inside diameter of gas line should be φ14mm (9/16”) or larger. The gas pressure within the line should range from 1.7Kpa—3.5Kpa (0.25 psi-0.51psi). A smaller than indicated inside diameter for the gas line or lower than indicated gas pressure can result in improper engine power and can cause electrical frequency problems that can damage electrical appliances, equipment, fixtures.

5. Fuel Type

Refer to chapter 3.7 for alternative fuel options or to switch fuel types.

6. Electrical Output Cables

Before usage, connect the output cables to the load output ends, make sure to keep the cables going though the openings and inside the generator enclosure, then connect to the load output terminals.

If there is an ATS (Automatic Transfer Switch) being used with the generator, it can be used to automatically switch the main power supply from your electrical service provider to the generator electrical power supply. To connect, connect the main electrical cable to the ATS control box's main input terminal.

Load output plugs

ATS control plug

Caution

The cable connections must be tight as the engine and generator vibrations may loosen connections over time and create the danger of short circuits. DO NOT remove or loosen any of the electrical cables while the generator is operating. Because of the non-conformity of the alternating current produced while the generator is running, this generator CANNOT be used in parallel with other generators. Your generator is prewired for single phase service. Pay close attention to where the neutral wire is connected.

7. Battery

The battery supplied with the generator is a maintenance free battery. The batteries voltage has been factory checked and verified before delivery. However, if the battery has been standing idle for an extended period of time, the available voltage may have decreased.

For use of the maintenance free battery, check the voltage before using. If the voltage is equal to or above 12.6v, then the battery is ready for use. If the voltage is lower than 12.6v, charge the battery first to this minimum voltage before using.

The "+"and "-" on battery should connect the positive pole and negative poles respectively on the engine. The connections should be tight. DO NOT connect them on the opposite sides or damage the electrical equipment of engine may result.

For first time battery usage, follow the following steps:

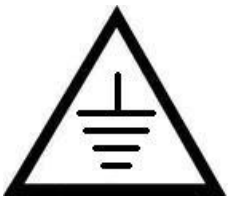
- Remove the red cap from battery positive terminal.
- Check to see if the battery voltage is 12.6V or higher. Charge the battery if the voltage is lower than 12.6V.
- loosen the positive battery connection from the engine and connect to the positive battery terminal, adjusting the direction as needed.
- Fasten the nut on the positive battery connection. .
- Cover with the red rubber battery cover.

Note

The “+”and “-” on battery should connect the positive pole and negative poles respectively on the engine. The connections should be tight. DO NOT connect them on the opposite sides or damage the electrical equipment of engine may result.

8. Grounding wire.

The engine must be grounded to the ground before use. Tightly connect the grounding wire terminal located on the outside of the generator to the ground using a grounding rod. DO NOT remove or not connect this terminal to the ground.



Wire terminal

Note

Make sure that the grounding wire is large enough to carry enough current. The diameter of grounding wire is 12mm（1/2 inch). We suggest using copper wire for the grounding wire.

Caution

The grounding wire is NOT SUPPLIED as part of the generator unit before delivery. Remove the rust-proofing coating from grounding terminal before connecting.

9. Preparation before starting the generator.

Note

Check the following items carefully before starting the generator.

- Visually check to see if all internal parts appear to be in normal positions and attached securely. Check to see if all connections are secure and tight. Check for loose bolts or screws that may need tightening.
- Visually check the NG/LPG fuel sources are available and working properly. If not, correct or make any adjustments before connecting to the generator.
- Visually check, after filling to required levels, for any leakage of engine oil and water. If visible, these must be corrected before starting.
- Visually check the gas pressure gauge and verify the correct pressure is being maintained. If not, correct before proceeding further.
- Visually check whether all electrical circuits are properly connected. Check to make sure the battery is charged to 12.6 volts or higher.
- For starting the generator for the first time, adjust the pressure regulator valve to the required pressure as the in-coming gas pressure may vary from location to location. Without proper adjustments, the generator may not start and run properly.
- Visually check for and clear away any excess dirt or grease that may have been accumulated during transit.
- Visually check engine oil and radiator coolant levels are at the full levels.
- Visually check and make sure that the in-coming gas pressure is steady. Fluctuations in gas pressure can cause the engine to stall or stop running.
- Visually check whether all electrical wire connections, both in and out, are secure and tight.
- Visually check surrounding the ventilation around the generator is as required.
- Visually check for and remove any flammable or combustible material within 10 feet of the generator.
- Visually check and make sure the gas inlet line is not kinked or incorrectly limited in any way.

IV. Generator Starting

Generator starting procedure:

1. Verify the emergency stop switch is not depressed.
2. Turn on the power switch.
3. Turn on the fuel switch.
4. Press “AUTO” (recommended) or “MANUAL” on the control panel. If “AUTO” is selected, the generator will start in 10 seconds. If on “MANUAL”, the generator will start immediately.
5. If using with an Automatic Transfer Switch and placed on “AUTO”, when there is not electrical power service from you electrical service provider, the generator will automatically start after 10 seconds.

Note

When electrical power service is lost from your outside provider, the generator will only start automatically and provide electrical power when placed in the “AUTO” mode and connected to an ATS (automatic transfer switch).

Caution

DO NOT open the generator enclosure top while the generator is running. DO NOT open the control box cover while the generator is running.

ONLY check on electrical or mechanical functions when the generator IS NOT running.

V. Operating the Generator

If the generator will not start, press the emergency stop switch. Rotate clockwise to pop up. After waiting for 30 seconds, try to starting again. If the generator cannot be started, check the generator carefully for loose wires, battery voltage, gas flow to the lines and generator, etc…

If after restarting the generator, the fault indicator light is red, the generator will shut down. If this happens, check the reason for the fault occurring. After correcting the fault, the generator is able to be re-started. If the fault indicator light remains off, then the generator is operating normally.

Confirm after starting that the normal electrical output range is not exceeded as this will damage the generator.

Note

After generator has been run for the first time for more than few minutes, shut the generator engine down and check the following items to make sure that all is in good working condition.

1. Radiator (coolant level)

To avoid injury:

DO NOT remove the radiator cap until the engine has cooled down. Loosen and unscrew the radiator cap slowly to avoid any unexpected overflows of hot coolant as severe burns can occur if excessively hot engine coolant touches your skin.

If while running the engine temperature is high, you may notice an overflow of the engine coolant from the radiator to the surface below. If this happens, check the following:

- Check for any engine coolant leaks.
- Check for any air intake blockage limiting air flow to the generator.
- Check for excess dirt or debris blocking any part of the radiator.
- Check for kinks or damage to the engine coolant lines going to and from the radiator.

2. Fault light indicator

If illuminated red, this is a warning that the engine or generator is not operating correctly or has stopped. If this light is red, shut down the generator and check for problems that may have occurred.

3. Exhaust color.

As long as the generator engine is running within the rated output range,

- The exhaust will be colorless.
- If the exhaust is dark grey or black when after running for 60 seconds or more, this is an indication of a problem. Shut the engine down until the problem is corrected.

4. Other problems requiring shutting down the generator

You should shut down the engine if the following circumstances happen.

- The engine speed is hunting (inconsistently speeding up and down)
- An abnormal noise is heard coming from the generator.
- The engine exhaust suddenly turns dark grey or black.
- The fault indicating light is illuminated.

VI. Shutting down the generator

Should a need occur to shut down the generator, shut down the electrical output first by turning the circuit breaker to the “OFF” position and depress the reset key. This will automatically shut the engine and generator down.

Note

If engine coolant temperature is too high, DO NOT immediately turn off the engine or the fuel switch to stop generator. Doing this could cause the coolant lines to burst do to and increase in engine coolant temperature and line pressure.

VII. Generator Fuel Switch

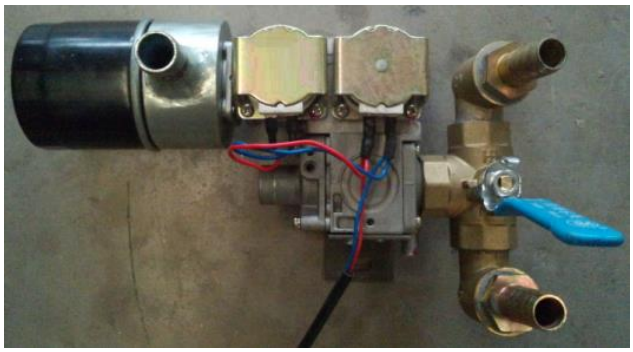
Caution

After starting the generator, the engines and its exhaust muffler will become very hot. During maintenance and inspection of the generator, avoid leaning against or touching these until they have substantially cooled.

Warning

DO NOT switch the fuel types while the generator is running!

If you need to switch fuel types, closely follow the instructions below:



1. Switching fuel types between LPG and NG

● When switching between LPG and NG, be aware that there may be different LPG or NG pressures between suppliers. If the pressure of LPG or NG is too high, you will need to install a pressure regulator valve to reduce the external pipeline to meet the generator requirements. The correct gas pressure for this generator is 2.0—3.5Kpa (0.29– 0.52psi) for LPG, and 1.7—3.5Kpa (0.25 psi-0.51psi) for NG.

● Depending on the type of fuel you use, turn the gas inlet valve to the correct position, see below photos for proper valve position:

NG

LPG

● Securely connect the gas inlet line to the gas inlet on the generator and tightly secure using proper clamps to avoid fule gas leakage.

● Check for gas leaks before starting generator.

● Check to make sure the gas inlet valve is in the correct position for the gas fuel type selected.

Chapter Four: Primary Parts Structure of Engine

The generator unit is assembled from a large number of integrated components, including the primary silent cooling system, electronic speed control system, automatic power generating system, multi-energy power generation technologies, intelligent control systems, and ultra-low temperature starting technology.

Ⅰ. Engine

Refer to the user manual for engine details.

Ⅱ. Generator

This generator is directly coupled and attached to the engine.

1. Alternator specification

Item	Unit	Spec
Related power	KW	20
Frequency	HZ	60
Speed	RPM	3600
Related voltage	V	120/240
Related ampere	A	83.3
Phase		Single phase double voltage
Power factor		1
Insulation level		F
Pole		2
Connect method		Direct coupling
Type		With brush synchronization alternator

2. Transportation and storage of the generator unit

- Transportation: During transit, extreme care must be taken to keep the generator in upright position and placed on flat surface. DO NOT lay the generator unit in an inverted, upside down manner, or lay on its side. If a crane is used to move the generator unit, lift and lower slowly, DO NOT jerk up or down or side to side.
- Storage: Prior to permanently installing the generator, store in a dry and well-ventilated, preferably indoor storage area, in an upright manner. DO NOT store in an area containing or in close proximity to corrosive gas such chlorine or other highly corrosive products.

3. Safety requirements

● Before cleaning, lubricating or performing maintenance procedures, ensure that the generator is shut down, stationary and disconnected from any remote power supply;

● The installer is responsible for the ultimate installation and following of all standard procedures.

● Installers should wear appropriate or required clothing and follow all local building code and installation requirements.

● Prior to installation, it is best to store the generator unit a cool and dry environment.

4. Note:

● The degree of protection to be used and observed for this generator is **IP23M**; short circuits may occur if liquids are spilled onto areas containing electrical parts and components. Do not clean the inside electric components with compressed air, as this may cause short circuits of certain electrical parts.

● DO NOT use or wear loose fitting clothing such as scarves, loose hanging shirt sleeves or tails while standing near or while working on the generator unit. If wearing loose fitting or hanging clothing in these circumstances, secure and tie down these loose garments with elastic bands of other fasteners.

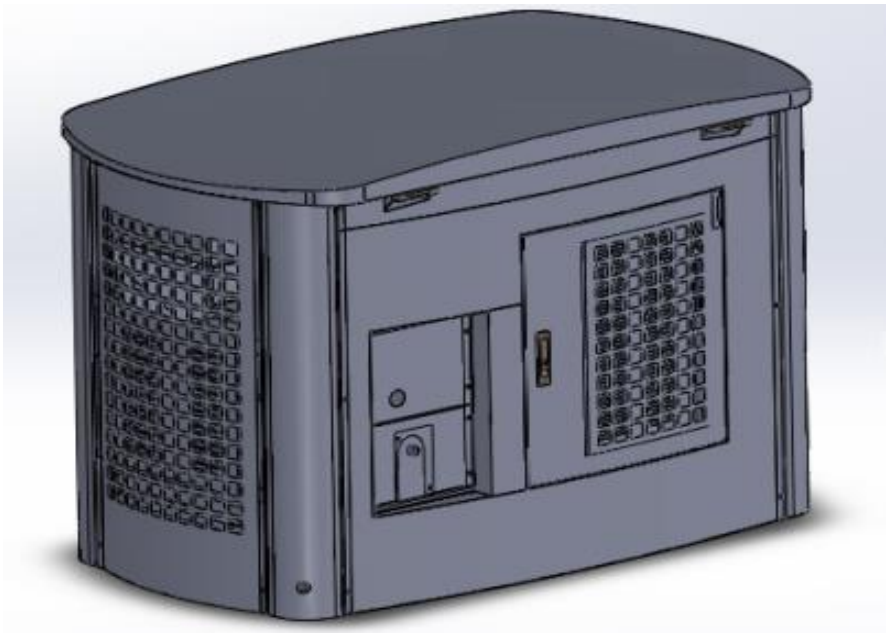
● DO NOT lean against or sit on the generator for any reason.

● Even though the generators machine and electrical components are inside the generators metal enclose, stay away from the generator while it is operating.

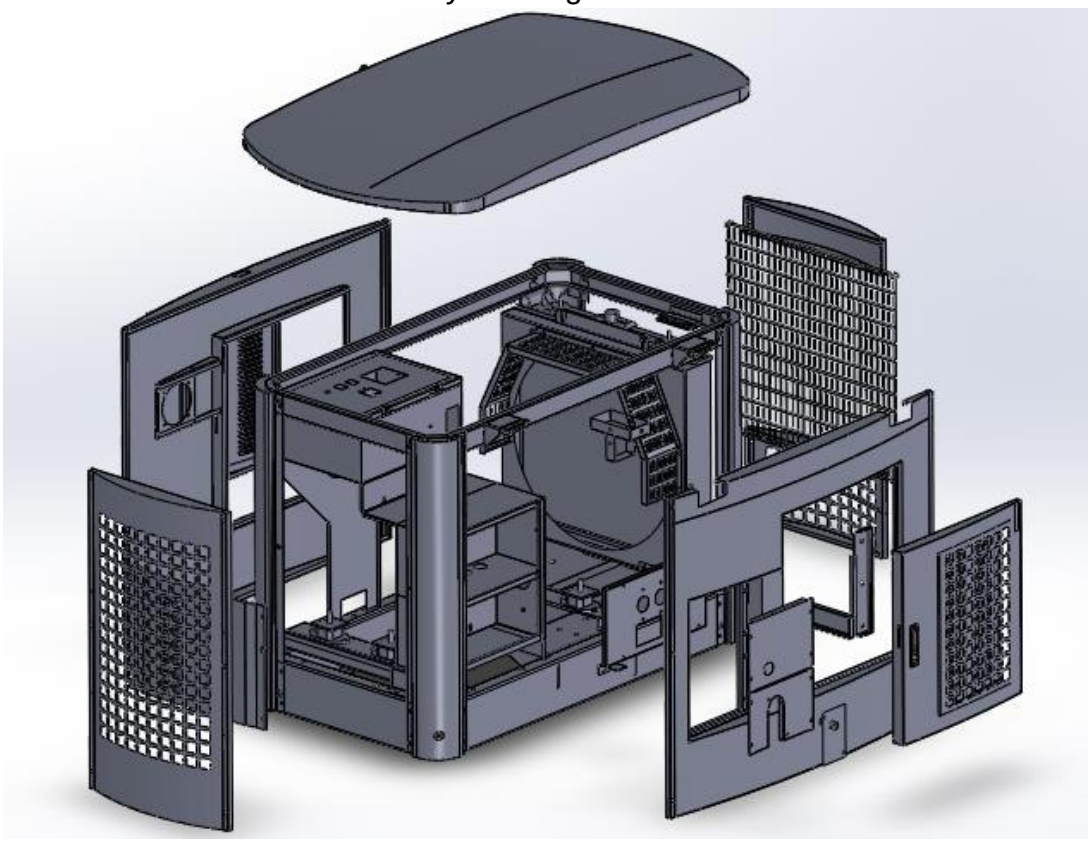
● DO NOT remove any of the attached labels for any reason. If these labels become damaged, aged, or are no longer legible, replace them.

● When the generator has met or surpassed its useful life, contact the proper disposal companies for ferrous materials and do not litter its parts in the environment.

Ⅲ. Generator Enclosure



Assembly drawing of enclosure



Expanded drawing of enclosure

The main frame and chassis are the primary structures to which all other component pieces are attached. The structure makes up the main noise protection and reduction features of the generator set. Other component parts include the chassis, Radiator compartments, electronic control box compartment, and electronic screen board compartments.

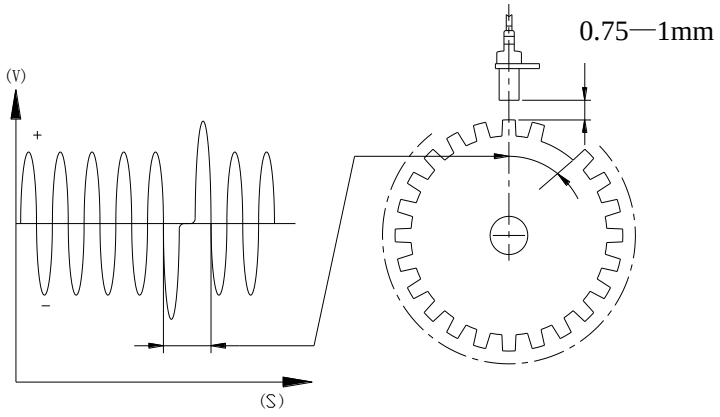
Ⅳ. Speed Regulating System

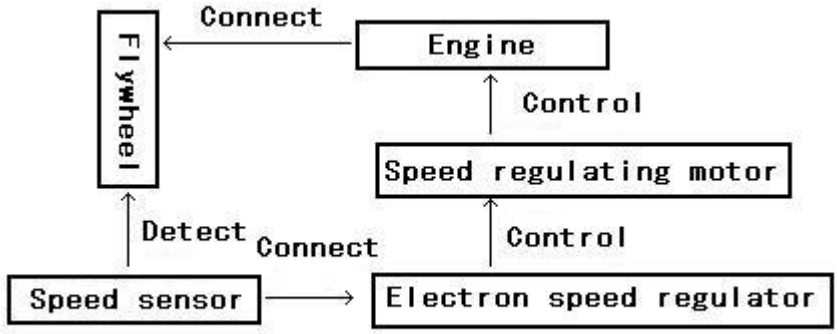
The speed regulating system is an important part which can affect the battery, frequency, and the generators constant running speeds. It is one of the important systems that measure the quality of the generator.

In order to control the steady frequency of the generator, a proprietary electronic speed control system has been adopted to reduce the reaction time needed to speed up and produce the electrical power output required and insure it is of very high quality. This helps protect sensitive electronic equipment and appliances from burning out or damage.

This proprietary electronic speed control systems primary function is to adjust the engine speed. Speed sensors detect the speed of the engines flywheel and transfer it to the electronic controller. As changes are detected, the controller immediately adjusts the engines speed and throttle valve which controls the air flow to the engine. If the engine speed is too high, the electronic speed regulator reduces the engine speed immediately and the gas flow intake. The engine instantly reduces speed due the decrease gas intake. Just the opposite occurs if the engine speed is too slow.

By continuously monitoring the engines performance and requirements, the proprietary electronic speed control system can ensure that the engines speed is in dynamic balance of within a tolerance of 1% deviation. The electronic speed control system can detect engine performance needs and fluctuations almost instantaneously and completely avoid engine damage in most circumstances.





Electron speed regulator Spec：

Item	Unit	Spec	Note
Power voltage	V	DC 12V	
Power consumption	mA	<70	
Output current	A	<5	
Speed fluctuation ratio		±0.25%	
Steady speed regular		0—5%	（speed reduce）
Vibrate	Hz	<100	
Impact	G	2	
Ambient Temp	℃	-30° — +70°	
Relative humidity		<95%	

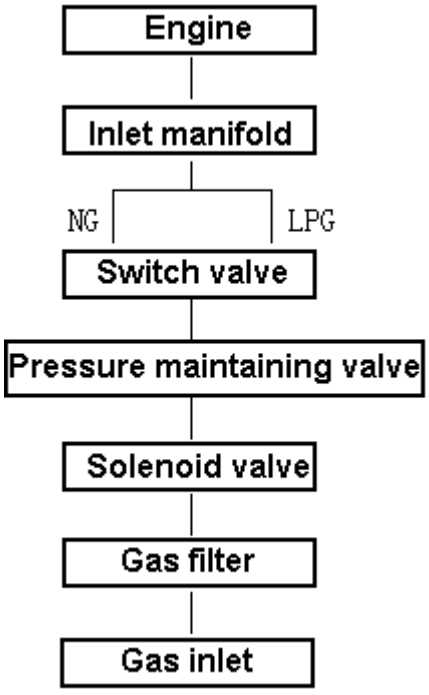
.

Note

Engine Low speed. high speed, and load stability are closely correlated to one another. When tuning the engine, all three must be noted. Optimizing the system's stability under each of the three states will achieve the best engine performance.

Ⅴ. Gas Fuel System

The gas fuel system can adjust the gas intake made available to the engine for combustion. By creating negative pressure, the gas fuel can be sucked into the venturi and mix with the incoming air.



1. Gas inlet: Connects the external fuel lines to the generator. The outer diameter is ¾" (19mm), and the internal diameter is 5/8" (15mm).

2. Gas filter: Will filter most impurities from the gas. The internal filtering element helps to prevent carbon deposits from building up inside the fuel lines, engine, and exhaust lines.

3. Solenoid valve: Included is an electrically controlled double solenoid valve and is operated by the electronic control system. It uses a 12V DC drive solenoid winding coil to produce a magnetic field which adjusts the sealed diaphragm upward or downward to allow the gas to flow as needed.

4. Gas Pressure valve: Adjust the inlet gas using the negative pressure created by the engine. This pressure is automatically reduced when absorbed by the engine. The diaphragm will adjust upward or downward as needed. The position of the diaphragm adjusts automatically applying to correct amount of pressure to the available gas flow as needed to force the gas feed to insure proper engine performance.

5、Switch valve: Allows selection of natural gas (NG) or liquid propane gas (LPG) gas as fuel. The gas line diameters have been pre-determined to optimize the gas flow. The flow of gas and operating performance of the gas system has been tested before leaving the factory. Adjustment of this system or lines by a non-professional may alter the flow of gas causing the engine not to start or run properly.

Ⅵ Control System

The intelligent control system is the core of the generator control system. The intelligent control system has an integrated and visual operational panel which includes the ability to set and monitor various system functions. It can also display different measured parameters, control parameters, and the generator operating status.

Sensors are located on the engine and generator to monitor liquid coolant temperatures, oil temperatures, engine operating conditions, generator operating condition, the quality of the electrical power supply, etc… It has the ability to switch to a self-protection mode should abnormal operations be detected. A remote operation port is available allowing trained professionals to set unique operating requirements.

Refer to the control panel user manual and the wiring diagram for a more detailed description of the control system.

Chapter Five: Maintenance of Generator

Regular maintenance is an important procedure in maintaining regular use of the generator. To enable the generator to remain in proper working condition, be sure to maintain the generator according to the maintenance specifications.

The following generator maintenance specifications are required procedures to help insure your generator remains in good operating condition. If the working or environment conditions where the generator is located are extreme, (such as excessive dust, heat, humidity, etc.) the maintenance period should be shortened to accommodate conditions.

Caution

When maintain the generator, operate in strict accordance with the following requirements. Improper operation can cause irreparable generator failure.

Ⅰ. First Starting & Running New Engine

The life of the engine is greatly related with the first use. The first starting and running the new engine should be done without any generator electrical load for one hour. After this one hour break in period, re-check all fluid and oil levels and refill as needed. Once completed, your new generator is ready for use.

Ⅱ. Fuel System Maintenance

The generator set is bi-fuel. It can run on natural gas (NG) or liquid propane gas (LPG) only. In regards the generators maintenance, maintenance will is different according to the fuel select.

Warning

Gas fuel is highly flammable and an explosive material. **Never use or have an open flame within 10 feet of the generator unit or the incoming fuel lines!**

1. When using LPG as fuel：

- Before beginning operation, check all fuel line connections and tighten any that are lose. Use a mixture of soap and water to check for gas leaks at all fuel line joints and connections. Tighten and stop any leads before starting the engine.
- If the LPG fuel tank needs to be replaced, first close the tank valve and turn off the engine power.
- After replacing the LPG fuel tank, re-open the tank valve and check again for any possible leaks at the fuel line joints and connections. Fix any leaks before re-starting the engine.
- Once per year, check the pressure valve to verify that the solenoid valve sealing pad is

not deformed. Before inspecting and dismantling, close the fuel line inlet valve to the engine. Then start the engine one more time to use up any remaining gas in the fuel line before removing the solenoid valve. Without using up the excess gas in the lines, high-pressure in the lines could cause work an unsafe working condition.

- Reducing excess pressure is an important component of the gas supply system. Pay particular attention to its operation. If there are any leaks, correct these problems to maximize fuel efficiency and reduce the risk of fire or explosions. Periodically remove the pollution discharge plug on the pressure reducer. Drain off any excess oil and condensation to increase the flow of fuel and increase the engines performance.

2. When using NG as fuel：

- Before beginning operation, check all fuel line connections and tighten any that are lose. Use a mixture of soap and water to check for gas leaks at all fuel line joints and connections. Tighten and stop any leads before starting the engine.
- Once per year, check the pressure valve to verify that the solenoid valve sealing pad is not deformed. Before inspecting and dismantling, close the fuel line inlet valve to the engine. Then start the engine one more time to use up any remaining gas in the fuel line before removing the solenoid valve. Without using up the excess gas in the lines, high-pressure in the lines could cause work an unsafe working condition.
- Reducing excess pressure is an important component of the gas supply system. Pay particular attention to its operation. If there are any leaks, correct these problems to maximize fuel efficiency and reduce the risk of fire or explosions. Periodically remove the pollution discharge plug on the pressure reducer. Drain off any excess oil and condensation to increase the flow of fuel and increase the engines performance.
- One per year, visually inspect the gas fuel lines for excessive corrosion or damage. If repairs to these lines are needed, close the gas valve leading to the lines before proceeding with any repairs.

Ⅲ. Maintenance of the Lubricating System

1. Engine oil

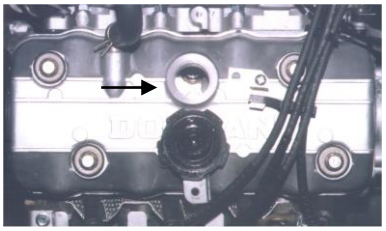
Oil viscosity: and weight: Select the appropriate oil viscosity and weight according to the average ambient temperature where the generator is located.

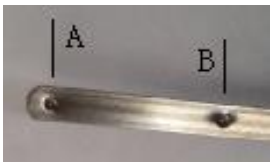
Always only use that oil that meets the standards set by the American Petroleum Institute: API SE SP SG or higher-level oil.

For first use engines, replace the engine oil at 30 hours running time. Maintaining the correct oil levels and replacing at the required time periods will help ensure of the long term durability and efficiency of the engine and its' useful life.

Note

DO NOT MIX OIL BRANDS OR WEIGHTS FOR USE AT THE SAME TIME.





2. Changing engine oil

Steps to changing the engine oil:

- Start and run the engine for 5 minutes, then turn off. This will increase the temperature of the engine oil, allowing it to drain smoothly and completely.
- Use a bucket of dish deep enough to hold all of the drained oil. Remove the drain plug and allow the engine oil to drain out completely.
- Check the oil drain bolt and its' gasket for damage. Replace them if necessary.
- Replace the oil drain bolt and gasket into the engine. Tighten sufficiently to prevent any oil leakage from the engine.
- Poor the new engine oil into the engine to the full level mark on the dip stick gauge.

3. Replacement of the oil filter

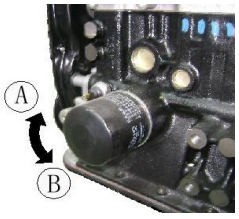
The oil filter must be replaced at each scheduled oil change and only when the engine is cool.

Steps for replacement：

- Use an oil filter wrench to remove the oil filter
- Before putting the new filter on coat the surfaced of the gasket with a thin layer of oil to adapt the new oil filter.
- Attach the new oil filter to the engine.
- Run the generator for a few minutes. Check for any oil leakage. Check the engine oil level again and fill oil to the specified oil level.

Note

Use oil filter wrench to attach the oil filter to a torque between 15N.M-20N.M. Be sure to check the oil spills and clean up sufficiently..



Direction A：TIGHTEN Direction B：LOOSEN

Ⅳ. Cooling system maintenance

While the engine is operating, there must be enough liquid coolant in the cooling system to insure sure the engine can run normally and not overheat. So always check the coolant level before running engine.

1、Only use high quality liquid coolant.

Caution

NEVER attempt replacing the engine coolant liquid while the engine is hot.

If the coolant needs to replaced, follow these steps:

- Get a container large enough for the coolant currently in the cooling system.
- Remove the radiator cap.
- Open the drain valve at he base of the radiator.
- Remove all of the coolant totally and use clean water to flush out the system.
- Once the flushing is complete, close the drain valve at the base of the radiator.
- Refill the cooling system with new liquid coolant through the radiator cap to the full level and then close the radiator cap tightly.
- Start the generator and run without any electrical load for one minute. Turn the generator off and re-open the radiator cap and check the coolant level. Add any coolant needed to fill the radiator to the normal running level. Again replace the radiator cap tightly and restart the generator, letting it run for another one minute. Stop the generator again and check to make sure the coolant level is still full. Add additional coolant if required and replace the radiator cap tightly.
- Fill the coolant overflow & expansion tank with coolant to the “FULL” level。
- Check carefully for any leads before restarting the engine.

Caution

Using excessive hard water, saline water or mineral water is harmful to the engine. If liquid engine coolant is not available, only use cold distilled water.

2. Radiator maintenance：

- Check the radiator hose and connections for leaks, kinks, or weathering. Tighten or replace as needed.
- If the radiator hose is hardened, cracking, or out of shape, replace the hose.
- Clean the radiator cooling fan. Use a clean damp cloth or air compressor to remove dust and dirt.

3. Check the water pump belt for excessive wear, hardening, or cracking and replace if needed.

Also check the belt for tension as it should be tight without any slack. The water pump belt is used to drive the water pump. If the water pump belts tension is lose, engine

overheating and severe damage can be caused.

Check the belt for defects：

7～10mm（1/4” – 3/8”in）/100N｛10.01kgf（22.1 lbs）｝

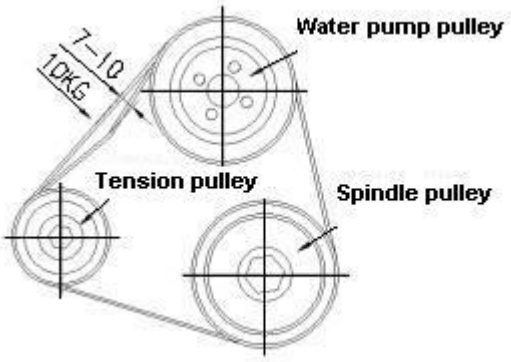
To adjust a deflective belt：

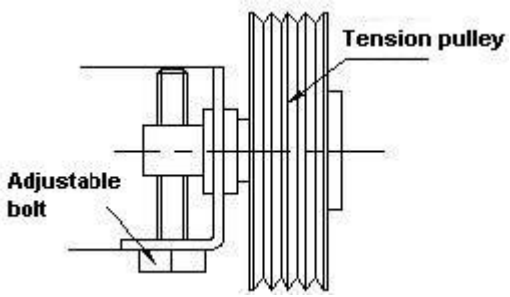
● Stop the engine.

● Use the thumb to press on the belt between the pulley wheels.

● If able to depress the belt more than 7-10mm (¼” to 3/8”) the belt is too lose and needs to be tightened. Adjust by tightening the tension pulley using the adjustment bolt (see below), until to the belts tension is within the acceptable range.

● Replace the water pump belt if frayed, torn, or broken.





Ⅴ. Air Filter Maintenance

Remove the filter cartridge and clean as scheduled according to the maintenance periodic table. Proceed as follows:

● Remove the filter cap and take out filter cartridge.

● Remove all visual dust on the filter cartridge with compressed air.

● If excessive dirt and debris are present on the air filter, in an outside environment, clean the filter cartridge with a cleaning solvent. Let air dry or use clean compressed air to speed up the drying process. **DO NOT** clean with water.

● Replace filter cartridge if broken or damaged.

● Re-install the filter inside the filter cartridge and replace the filter cap.

Ⅵ Winter or Cold Weather Maintenance

Note

When the air temperature remains under **40 degrees Fahrenheit** (5℃), please maintain the engine as follows:

1. ONLY use **(see oil type chart on page 17 of this manual)** engine oil
2. Use 100% antifreeze in the coolant system. Remove any non-antifreeze coolant when the temperature remains below 40 degrees Fahrenheit (5℃), for more than 2 hours and replace with ONLY liquid 100% antifreeze coolant.

Ⅶ Ignition system maintenance

This engine uses an electronic ignition; the order is 1-3-4-2. Only use spark plug types F7TC or the similar. Using the wrong type of the spark plug will damage the engine.

Steps to take for checking or replacing spark plugs:

● Remove the wire from the tops of the spark plugs.
● Remove the spark plug with spark plug socket.
● Check for visual signs of excessive wear on the spark plugs such as broken poles or broken spark plug insulators. Replace spark plug if excessive wear is noticed.
● Check to insure that the spark plugs gap is over or under the recommended amount (**The right gap of spark plug is 0.9-1.1mm),** adjust as needed.

Note

The right gap of spark plug is 0.9-1.1mm

●Screw the spark plug by hands, tighten with spark plug socket.
● Reconnect the spark plug wire tightly.

Ⅷ Maintenance of Other Systems

● Keep the generator clean.
● Lubricate and apply antirust protection to all connections, bolts, screws, etc…
● Periodically check to make sure that all the screws and bolts are tight.

Ⅸ Periodic Maintenance

Maintain components as indicated in the following table to obtain longer engine life time and dependable operation. The "●" sign indicates that a scheduled maintenance of the item shown is required at that time. **Not performing the required maintenance functions at the indicated intervals will effect and possibly void all generator warranties**.

Item	Remarks	Pre check	New engine running-in	Every 100 Hr	Every 200 Hr	Every 400 Hr	Every 1000 Hr
Engine oil	Check engine oil level	●					
	Replace engine oil		●		●		
Engine oil filer	Clean				●		
	Replace		●			●	
Air filter	Clean		●	●			
	Replace					●	
spark plug	Clean			●			
	Replace					●	
Cooling system	Check engine coolant level & for any leaks	●	●			●	
	Clean radiator				●		
	Check the fan running condition			●			
	Check radiator hose connections		●				●
	Change engine coolant				●		
Gas valve	Check adjust to correct fuel, NG or LPG	●			●		
Gas pipe	Check gas lines for damage or rot		●			●	
Exhaust system	Check for leaks，seal tightly or replace the seal gasket.		●				●
Screw and Nut	Check all screws, bolts, nuts for tightness and tighten as needed.		●		●		
Water pump belt	Check for tension, fraying, or damage and replace if necessary.		●	●			
	Replace						●
Timing belt	Depends on the wear pattern	Change every 5000 hours					

Chapter Six: Engine Troubleshooting

Ⅰ. Common Problems and Remedies

Number	Problem	Possible Problems
1	Hard to start	**Ⅰ.Electrical system fault** 1. Low battery voltage； 2. Poor battery terminal connections to wire or at starter 3. Alternator problem； 4. Ignition system problem 5. Spark plug carbon build-up 6. Improper spark plug gaps 7.Spark plug insulation burn out or short circuit 8. Ignition coil burnout; 9. Wire or cable burnout; 10. Solenoid valve connection or problem **Correction methods：** 1. Check the battery voltage to see the whether it under 12.4v, if so then recharge. 2. Check the for damage to battery cables 3. Check the starter blockage by debris 4. Check the spark plug wires, one at a time, for electrical current by pulling the wire lose from the spark plug/plugs and holding close to engine block while trying to start engine. If no spark is created or noticed, then replace the spark plug/plugs. 5. Replace spark plug 6. Correct spark plug gaps 7. Replace spark plug/plugs 8. Replace ignition coil 9. Replace wire or cable 10. Tighten cables or replace solenoid valve if burned out
		Ⅱ、Air flow system problem： 1. Keep the gas in-take valve in the off mode；(open the valve) 2. Pressure reducer or solenoid valve damaged；(replace) 3. Supply voltage is too low, can not open the line solenoid and solenoid of the pressure reducer； (replace the battery or charge battery)

		4. Solenoid valve not connect tightly；(tighten) 5. Fuel switch damaged or not placed in “ON” position 6. Blocking of the high pressure line；(Use the spanner to open the joint easily, if leaking, then the parts are ok, repeat steps to check one by one) 7. Low pressure line collapsing；(replace) 8. Oil filter is dirty; (clean) 9. Check LPG、NG pressure to see if is normal or not；
2	Idle unstable	1. Pressure seals not tight；(tighten) 2. Check the adjustment screws of the regulator if lose, check all of the connections of the gas inlet line and regulator for leaks 3. Check the fixed bolt of speed motor to see if lose 4. If replaced fuel, check whether the fuel switch valve is on and in the right position. 5. Check the LPG、NG pressure to see if normal. If using fuel tanks, check the tank level of the fuel. 6. Check the pressure regulating valve to see if tight. 7. If using LPG, check the LPG tank surface to see if frosted over which could signal low fuel levels 8. When replacing the fuel tank, follow strict replacement rules.
3	Engine not running smoothly	1. Spark plug wires not connected tightly 2. Speed signal is not correct: (check or replace the sensor) 3. Temperature of pressure reducing is low 4. Pressure reducer not working normally: (repair or replace) 5. Cylinder head leaks：(check cylinder head screws, when necessity replace the cylinder head gasket.

4	Engine power low, power hunting, or increased usage of the NG	1.Fuel line leakage；（tighten or replace） 2. Ignition system does not have enough ignition power 3. Power cable line and FBT will not tighten 4. Power cable and spark plugs not tightened 5. Cylinder firing sequence missing: (re-set to 1, 2, 3, 4) 6. Remove spark plugs, check surface and gap to see if it has a burned trace, if yes, replace the spark plug. 7. Use a multi-meter（XKΩ GEAR）to test the resistance of the power line, change as needed. 8. Low cylinder pressure, (check the adjustment valve and check or replace the packing ring) 9. High pressure line blocked or out of shape (clean out) 10. Dirty or low air volume (change or clean the air filter) 11. Carburetor not operating well (rebuild or replace) 12. The connection of carburetor and throttle leaking (tighten) 13. Check gas pressure flow and pressure 14. Timing belt damaged or excessive wear: (change the belt) 15. Air filter , exhaust system jam:(clean air filter and exhaust line); 16. Voltage output unstable;(adjust or change voltage regulator)
5	Stops suddenly	1. Safety fuse was burned out；(replace) 2. Fuel valve connection bad; (tighten) 3. GND connection lose; (tighten) 4. Radiator thermostat ices over: (Change liquid coolant) 5. Radiator thermostat leaks (tighten or replace) 6. Air filter dirty: (change or clean) 7. Solenoid valve fault closed 8. Emergency stop switch malfunction

6	Abnormal sound when the engine is operating	1. Ignition timing is too fast 2. Ignition timing is too slow causing exhaust back firing For Item 1 & 2: (adjust timing at the distributor)

7	Engine oil temperature too high	1. Check for engine ventilate blockages of obstructions 2. Engine load is too high 3. Engine oil level is low or too high 4. Low exhaust emissions: (replace the packing ring) 5. Blockage in oil cooler, oil temperature controller valve opened, blockage due to dirt 6. Oil type is not correct (oil viscosity is too high) 7. Check engine liquid coolant level
8	Low Engine Pressure	1. Low oil level: (add oil to the required level) 2. Oil pump damaged: (replace the oil pump) 3. Oil strainer or the oil filter blocked 4. Damage to or blockage in the relief valve or the stabilivolt valve spring 5. Block or leakage in the oil line (For Items 3, 4 and 5: replace parts)
9	Engine coolant high temperature	1. Coolant temperature sensor not working properly – Remove, check and clean or replace if needed. 2. Engine coolant low (add coolant) 3. Engine load is too high 4. Check for air in /out ventilation
10	Starter not working	1. Starter will not run 2. The starter power weak 3. Starter gear will not run over (For items 1,2, & 3, check the battery cables for voltage and make sure fastened tightly to each end, replace if needed)
11	Muffler exhaust is black	1、Check the air filter to see if blocked or obstructed 2、Pressure regulator valve not working normally: (Adjust the valve screw) 3、Ignition time too fast: (adjust ignition timing) 4、Spark plug not firing properly 5、Power cables not connected properly (4 & 5: replace the related parts)
12	Muffler exhaust is blue	1、Check engine oil level. If too high, reduce to normal level. 2、Replace or clean the oil filter and gasket
13	Muffler exhaust is white	1、Engine is starting cold 2、Water or moisture in gasoline - check for oil leaks 3、Water in the cylinder: (overhaul the engine cylinders)

14	Muffler shows flames or making exploding noise	1、Carburetor floater oil level is too high, adjust the floater 2、Exhaust valve is not totally sealed 3、Ignite timing is too slow, adjust the ignition timing

II. Alternator Common Faults and Troubleshooting

No.	Fault Symptoms	Reason & Troubleshooting
1	Generator does not indicate power	1. Power cable line has a short circuit 2. Power cable line resistance is burned out Check and replace as needed
2	Generator indicates power but no output	1. Breaker is in the “OFF” position 2. AC output has poor connection（tighten connections）
3	Generator overheating	1. Loosen or worn out of water pump belt（Adjust or replace belt） 2. Low coolant level or blocking of line（Add coolant or clean line） 3. Worn out or damaged water pump（Clean or replace pump） 4. Low engine oil level（Add engine oil） 5. Dirty or damaged oil filter（Clean or replace oil filter） 6. Clogged or worn out oil pump（Clean or replace oil pump） 7. Engine oil leak (Find leak and trouble shoot quickly） 8. Damage of rotor bearing（Replace bearing） 9. Damage of cooling fan（Replace cooling fan） 10. Blockage or damaged radiator（Clean or replace radiator） 11. Short circuit of stator winding（Check wiring） 12. Grinding of stator and rotor （Check, adjust gap）
4	Low output power	Abnormal gas pressure（adjust pressure）

III. Common Faults and Solutions of LCD

No.	Fault Symptoms	Reason & Troubleshooting
1	Controller non responsive or will not power up	No electrical connection（check wire connection to battery） Line fault or wrong connection（check controller connection） Insure damage（check insure）
2	Generator stops	Abnormal temp.（check water/cylinder temp. is too high） Unstable voltage or abnormal（check alternator voltage） Insure damage（check DC insurance）

3	Controller emergency stop	Line fault or poor connection（check to see if emergency stop function is correct） Check to see if battery connection is correct（check if battery positive pole connected to the emergency stop input） Line fault or poor connection（check if connection is open circuit）
4	Alarm after starting	Sensor or wire cable may have problem（check engine oil pressure sensor, water temp. sensor connections）
5	Generator running but not changing-over	Line fault or poor connection（check ATS, check the connection between ATS and controller） ATS wrong setting（check COM port for correct setting）
6	RS485 not communicating normally	Line fault or poor connection（check RS485 line A and B for proper connection） Transition module damage（check RS485 transition module is damaged, replace if damage） Communication port damage（check for PC communication port damage, replace if damaged）

IV. Troubleshooting

1.) Poor electrical connections

- Battery voltage, verify the voltage is correct
- Low fuel gas supply, verify gas cylinder solenoid valve is open
- Incoming solenoid valve at generator open
- High voltage normal (check spark plug）
- Speed sensor signal
- Observe exhaust gas (smell, color, sound)
- Replace the faulty parts with the new.
- If the fault has stopped, replace the faulty parts, then re-start the engine and observe to verify the problem exist again.
- If the fault re-appears, then it is verified that the parts were damaged, replace the damaged parts with new.

V. Other problem conditions and remedies

Engine will not start:

Generator will not start normally. Follow these steps:

1. Visually check for loose wires or electrical cables?

- Check engine oil level, high or low?
- Check engine coolant, high or low?
- While attempting to start, is the emergency stop switch button open or closed, (press down to close, press up to open)
- Check if main inlet gas valve is open or closed? Is there gas flow through when

open?

- Make sure the battery has 12.4 volts or higher?
- Is the power indicator light on or off?

2). Measurement verifications:

- Fuel gas pressure flow pressure is too high: Turn the regulator adjustment screw to adjust the gas line pressure.
- Battery voltage verification: use the volt-meter to test the battery voltage, if the voltage is 12.6 V or higher, the battery has enough power; If the voltage is below 12.6V, the battery will not turn the starter. Recharge or replace battery.
- Cylinder and plug wire check: Refer to the following photo, the plug gap between the conductor and plug body should be 3-5mm.

Generator hunting elimination:

After starting the generator, if there is an irregular vibration or the engine seems to speed up and slow down, the generator may be experiencing “hunting”. This is a common occurrence until the engine adapts to the incoming fuel mixture. “Hunting” can cause the electrical frequency to fluctuate >2Hz. In most cases the engine will adjust itself after a couple of minutes. Except for sensitive, high precision electrical equipment, “hunting” will not interfere with the electrical output of the generator and its’ output. In the event high precision electrical equipment is being used, while the generator is “hunting”, the high precision electrical equipment should be immediately disconnected or turned off until the generator stops “hunting”.

1.) General solutions for “hunting”:

● Check the fuel gas pressure, adjust as needed.

● Check for incoming fuel line kinks or blockage, correct as needed.

● Check to see of the speed sensor is lose, tighten as needed.

● Check the electrical speed regulator normal or not

2.) Measurements checking solutions for “hunting”:

● Close the incoming valve, attach a pressure meter to the inlet line,open the fuel gas line and verify the incoming pressure is correct..

● Visually inspect fuel gas valves for damage, blockages, of debris.

● Open the fuel switch; listen to the valve to make sure solenoid valve.

● While engine is turned off, turn the speed sensor by hand to see if lose or tight.

● Check the electrical speed regulator for 12v DC power in/out.

3.) Final solution for “hunting”::

If the “hunting” problem is not corrected by solutions is #1 and # 2 above, replace the electrical speed controller or actuator.

Trouble shooting no electrical power output

After starting the generator, electrical power output is not being produced, follow the following steps to check and correct the problem:

1.) General solutions:

● Check the battery voltage (Voltage>12V).

● Check the voltage regular input and output cable for proper connections.

● Connect the voltage regular and the battery. Check to see if they show the same input voltage.

● With the generator running and operating normally, the carbon brush should produce approximately 70V of voltage.

2.) Measurements solutions

● Use a 20V multi-meter to measure the battery voltage, and the input side of the voltage regular, and carbon brushes.

● Use a 200V multi-meter to measure the voltage at he carbon brushes.

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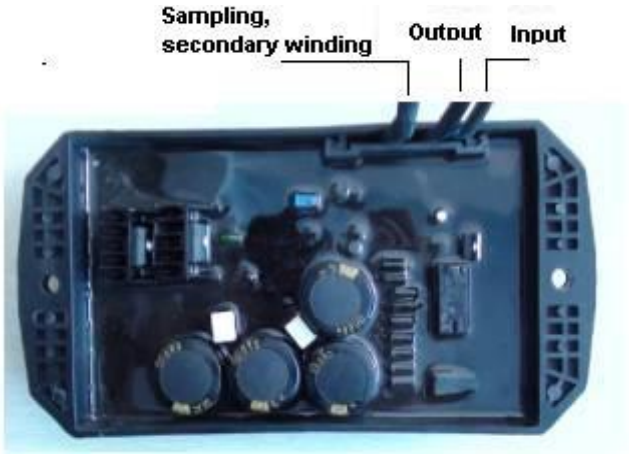
3. Final solutions：

● When the correct voltage is correct on the input side but not on the output side, there may be three (3) possible types of protection modes causing the problem (input protection, sample losing protection, secondary winding protection). First, cut the positive incoming power. After waiting 90 seconds, connect the incoming electrical power again. Under normal weather and operating conditions waiting time should be the 90 seconds. If there are abnormally cold or hot weather conditions or unusual operating conditions, the wait time may be up to one (1) hour.

Voltage regular wiring:



Wiring: white wire and green wire (not distinguished between positive and negative poles)

Secondary winding: Blue wire (not distinguished between the positive and negative poles)

Input: Blue and white wire, green wire (blue and white wire, connect with the positive pole, green wire connect with the negative polse)

Output: Red wire, black wire (connect with the carbon brushes, not distinguish positive and negative poles)

Note

When connecting to the generator stator input side, improper wiring connection can cause the electrical components to burn out or cause damage to the generator.

Chapter 7: Engine Storage

Ⅰ. Prolonged engine storage

1. Remove dirt from the engine

2. Drain all engine coolant

3. Check all electrical cables are clean and in good condition

4. Remove all of the spark plugs from the engine block, add approximately 30g of engine oil into each spark plug opening, turn the crankshaft about 20 revolutions, and then place the spark plugs into each location on the engine block.

5. Use water proof petroleum jelly, heat to 100-200 degrees Fahrenheit and wipe on the surface of all electrical contacts where they contact metal.

6. Add lubricating oil to each lubrication point.

7. Loosen the water pump belt.

8. Check the tightness of all the nuts and screws, tighten as needed.

9. Turn off the gas inlet valve, and depress the emergency stop button. Seal the rubber line openings with rubber sealant to keep clean.

10. Remove the battery cable lines from the battery and remove the battery. Store the battery in a dark and dry location. Every three months, recharge the battery

11. Cover with a protective material (such as canvas. water proof cloth, or oil paper).

12. Store in clean room not exposed to the sun with the best air temperature being between 40 degrees and 95 degrees Fahrenheit with a relative humidity between 40-70%.

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Ⅱ. Starting engine after prolonged storage period

1. Reverse the above steps starting with step number 12 and ending with step number 1.

13. Start engine and check if running normally.

Attachment One: Generator common service parts

Item	Name	Model	Unit	Quality	Note
1	Engine	465Q5	PC	1	
2	Starter	QDY112	PC	1	
3	Flywheel	465-96T	PC	1	
4	Carbon brush	L65	PC	1	
5	Tension pulley	4PK-Φ75	PC	1	
6	Water pump belt	4PK-700	PC	1	
7	Manifold inlet pad	465Q-2	PC	1	
8	Exhaust manifold pad	465Q-1	PC	1	
9	Dry type ignition coil	126	PC	1	

10	Speed sensor	465Q5	PC	1	
11	Water temperature sensor	CM-24B	PC	1	
12	Solenoid valve	QVT-4	PC	1	
13	Pressure regulating valve	T0200	PC	1	
14	Fan	YWF4D550	PC	1	
15	Water tank	AT/TO-123	PC	1	
16	Mixer assembly	015A0372	PC	1	
17	Electronic actuator	T0400	PC	1	
18	Air filter core	6331E	PC	1	
19	Air filter pipe	Φ50×500	PC	1	
20	Oil filter wrench	HM-501	PC	1	
21	Spark plug socket	L114	PC	1	
22	Spark plug	F7TC	PC	4	
23	Universal wheel	Φ125-32	PC	2	
24	Directional wheel	Φ125-32	PC	2	
25	Foot support		PC	4	
26	Temperature control	45°, 90°	PC	1	Each with one pc
27	Heating pipe	500W AC220V	PC	1	
28	Waste pipe	015A0370	PC	1	
33	Wire harness		PC	1	
34	Alternator	20KW/120V/240V		1	

Attachment Two: Universal formulas

Item	Unit	Conversion
Power	kW	1kW=1.36Ps
Torsion	N·m	1kgf·m=9.81N·m
Speed	r/min	
Engine oil, fuel oil consumption	g/kW·h	1g/Ps·h)=1.36g/kW·h
Capacity(L)	L	1L=1000ml
Proportion	cm2	$1m^2=10000cm^2$
Pressure	kPa MPa	1kgf/cm2=98.1kPa=0.0981Mpa
Power	N	1kgf=9.8N
Length	m	1m=1000mm
Time	min(s)	1min=60s
Temperature	K（℃）	273K=0℃
Voltage	V	
Current	A	
Crankshaft corner	°CA	Degrees crankshaft corner
Quality	g	1kgf.m=9.81N.m